

Appl. No. 09/674,648
Amdt. dated July 12, 2006
Reply to Office action of March 27, 2007

REMARKS/ARGUMENTS

Claims 1 and 3 - 5 are pending.

Claim 1 has been amended to call for the functional elements to be drive or control functional elements by kneading, swaging, or stretching (paragraphs [0014] and [0019])¹. Claim 1 has further been amended to make it clear that the axial forces are applied to the ends of the tube while applying a medium under high internal pressure to the tube (paragraphs [0016] and [0033]). Claim 4 has been amended to remove reference to claim 2.

The objection set forth in paragraph 2 of the Office Action has been corrected.

The rejection of claims 1 and 3 - 5 under 35 U.S.C. § 103(a) as being unpatentable (a) over Suzuki U.S. Patent 4,660,269 ("Suzuki) in view of Jordan U.S. Patent 4,382,390 (Jordan) and (b) over Suzuki in view of Dawson et al. IPN WO 88/00643 ("Dawson et al.") are both respectively traversed. The claims have been amended to clarify the distinctive nature of the invention. Thus claim 1 has been amended to make clear that the axial forces are applied to the ends of the tube at the same time as the application of the medium under a high internal pressure.

Application of axial forces helps to prevent thinning out of the shaft. Without application of axial forces the bulging out parts of the shaft thin out while within the cams the surface increases. Since there is only limited material available, the material distributes over the total area, with less material at the cam sites. Such a thinning out phenomenon weakens the shaft at the cam locations. Applying axial forces results in the delivery of supplementary material into the cam regions and therefore avoids thinning out.

Suzuki does not disclose such an application of axial forces. Suzuki just mentions the possibility to temporarily fix the shaft end caps by swaging in the axial direction. However, hydraulic pressure is applied into the hollow shaft thereafter, not at the same time (col. 2, lines 11-17). This can also be seen from col. 2, lines 34 to

¹ Paragraph numbers refer to the clean replacement specification filed with the March 5, 2004 amendment.

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35 showing that compression of the hollow shaft in the axial direction is for temporarily fixing the cam discs and the shaft end caps before the step of introducing a fluid under pressure. Suzuki is silent about application of axial forces at the same time as the application of the medium under high internal pressure for delivery of supplementary material into the cam regions. Therefore the invention is new and unobvious over Suzuki

The claims have also been amended by including the feature that the cam shaft ends are deformed by kneading or swaging in order to form functional elements, namely drive and control elements. Thus another aspect in which the invention differs from Suzuki is the upsetting of regions that lie at the ends of the tube outside the regions in which the cams are seated. Suzuki solely discloses fitting shaft end caps over the ends of the hollow shaft, however, therefore neither deforming the ends by kneading or swaging nor forming drive or control elements.

The invention has the advantage that round kneading or upsetting is combined with the IHU method resulting in very low manufacturing complexity and low costs. These costs are more especially reduced because the number of individual parts to be separately manufactured and then to be fitted is extremely low. Owing to manufacture in accordance with the invention, sources of error are minimized, errors which occur in the fitting together of parts as practiced prior to the invention. Thus, in contrast to the invention, in Suzuki the number of parts to be fitted is higher since separate end caps have to be fitted over the ends of the hollow shaft.

The advantages of the invention, of low manufacturing complexity and costs because of the low number of individual parts, are not achieved by Suzuki. Moreover, the number of sources of error is higher with Suzuki because more parts must be fitted together. Finally, Suzuki does not disclose shaping of drive and control elements at the ends of the tube. Accordingly, the invention as defined by the claims must be seen as novel and unobvious.

Neither Jordan nor Dawson et al. disclose the application of axial forces while applying a medium under high internal pressure to the tube. Neither Jordan nor

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Dawson et al. also disclose the possibility of upsetting or kneading the regions that lie at the ends of the tube. Accordingly, neither secondary reference bridges the gap in the limited Suzuki disclosure.

Applicants believe the claims are in condition for allowance and respectfully solicit a Notice of Allowance.

The Commissioner is hereby authorized to charge payment of any fees required associated with this communication or credit any overpayment to Deposit Account No. 50-3881. If an extension of time is required, please consider this a petition therefore and charge any additional fees which may be required to Deposit Account No. 50-3881. A duplicate copy of this paper is enclosed.

Dated: July ¹¹~~12~~, 2007

Respectfully submitted,

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